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HRI Project 1666-01
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RE-EVALUATION OF MOUNT NEWMAN DUMPS, RICO, COLORADO

for

Crystal Oil Company
P. O. Box 1101
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INTRODUCTION

In a report[1/] dated December 29, 1973, Hazen Research, Inc., provided a brief review of the mineral property of Rico Argentine Mining Company and reported on a test program then under way at Rico to recover silver and gold from dump rock by dilute cyanide leaching.

During 1974, a heap of approximately 77,000 tons was prepared and cyanide extraction was carried on from July to November; however, of this period full scale operation amounted to about three months. Operation was resumed in May, 1975; barring unforeseen interruptions, the 1975 operating period could continue for six months or more.

The 1973 economic forecast was based on precious metal values then prevailing, $100.00 per ounce for gold and $3.00 per ounce for silver, and on capital and operating costs that were rough estimates. With metal prices now much higher than in 1973, Hazen Research, Inc., has been requested to prepare a new evaluation to reflect the prevailing market conditions of gold at $165.00 per ounce and silver at $4.30 per ounce.

The report is based upon data supplied by the Rico Argentine Mining Co. and from brief visits to Rico in October, 1973, and November, 1974.

1/ Hazen Research, Inc., 1973. "A Review of Test Leaching Project and Notes on Mineral Exploration Potential at Rico, Colorado. HRI Project 1471.

SUMMARY

A 1973 valuation of gold and silver bearing dump material near Rico, Colorado, concluded that the dumps contained about 495,000 tons of material which, at 80% recovery, would provide the objective 400,000 tons considered necessary for an economic heap leaching operation using dilute cyanide to recover gold and silver. The metal content was valued at the then-prevailing gold and silver prices of $100.00 per ounce and $3.00 per ounce, respectively, for a gross value of $8.00 per ton. It was estimated that the gross value of recovered metal would be $5.54 per ton, costs would be $3.24 per ton, yielding a return before taxes, depreciation and depletion of $2.30 per ton, or about $900,000 for the dump reserves.

During 1974 a 77,000 ton heap was leached from July to November of which period the actual operating time was approximately three months. Process changes and unanticipated problems were responsible for delays. As a result, about 12.7% of the calculated gold content and 9.6% of the calculated silver content were extracted.

Prices of gold and silver have risen sharply since late 1973. The gross value of the dump reserve, 375,000 tons now remaining, is estimated to average $10.35 per ton. No change in the dump reserve has been made other than to reduce it by the 77,000 tons placed in the first heap and to adjust the average grade accordingly as that material first leached was the highest grade.

At an estimated recovery of 75% of the gold and 70% of the silver and assuming a prevailing price of $165.00 per ounce for gold and $4.30 per ounce for silver, the gross value of the remaining recoverable dump reserve is estimated to be $8.88 per ton.

Annual metal recovery cannot be accurately forecast on the basis of the 1974 campaign. The operators forecast a gross revenue of about $1,100,000 for the 1975 season during which time the second heap will come on stream. Using 1974 recovered metal ratio of 1:122, the anticipated 1975 production would be 1,600 ounces gold and 195,000 ounces silver.

An ultra conservative production forecast might be as low as 700 ounces gold and 91,000 ounces silver, which at present prices would provide a gross revenue of $506,800, well in excess of the projected $300,000 operating expense.

The prediction of future gold and silver prices is very difficult. It appears that the present price levels are fairly stable, so there is reason to expect little immediate downside risk on the profitability of the Rico operation. Even assuming capital and operating costs of up to $5.00 per ton of reserve, a pretax income of $1,500,000 may be expected, exclusive of depreciation and depletion credit.

DUMP ORE RESERVES

RESULTS OF PREVIOUS SAMPLING

The 1973 report[1/] listed the estimated reserves to be 494,470, as follows:

	Dry Tons
By survey:	
Group dump	281,219
Syndicate dump	78,251
By estimate:	
Newman dump	45,000
Vestal dump	45,000
Jumbo dump	22,500
Enterprise dump	22,500
Total	494,470

The first heap was made of rock from the Syndicate dump. The heap is estimated to contain 77,000 tons and is reported that 5,000 to 6,000 tons remain on the dump, some of which may be recovered ultimately.

This suggests that the estimates based on surveys are relatively conservative. However, it is impractical to attempt 100% recovery of these dumps so the apparent conservatism of the estimates would suggest that the original objective of a 400,000 ton reserve for leaching is reasonably secure.

1/ A Review of Test Leaching Project and Notes on Mineral Exploration Potential at Rico, Colorado, December 29, 1973, page 22.

ESTIMATED METAL CONTENT

Many of the dumps have been surveyed and sampled in the past to evaluate the dumps as feed for bulk flotation to make a concentrate suitable for smelting. It was recognized that most of the metal values were in the minus 1/2-inch fraction. Tests showed that minus 1/2-inch material constituted 30% to 50% of the dumps sampled. The value of the minus 1/2-inch was reported to be $4.48 to $4.85 per ton with gold valued at $35.00 per ounce and silver at $0.7711 per ounce. The reports do not provide assays for all size fractions as only the minus 1/2-inch was of interest and its value is given only in total dollars.

The sampling of the five dumps from which the 210-ton test heap was built provide the best available information on the gold and silver content of the dumps as a whole. The table below shows the assays of test material.

		Assays, oz/ton			
		Root & Norton		Union Assay	
Source (dump)	Tons	Au	Ag	Au	Ag
Group tunnel	34.14	0.01	1.45	0.01	1.8
Vestal	41.04	0.02	2.22	0.01	1.4
Aspen	46.83	0.03	3.99	0.02	4.2
Enterprise	46.10	0.03	3.36	0.02	3.0
Syndicate	42.50	0.04	5.28	0.03	3.8
	210.61	0.029	3.35	0.018	2.92
		(weighted averages)			

Duplicate samples were not retained for umpire assay. The values above can be averaged to provide an estimate of the precious metal content of the remaining dump reserve, as follows:

	Average, oz/ton			Content, oz	
Dump	Au	Ag	Tons	Au	Ag
Group	0.01	1.62	281,219	2,812	455,575
Vestal	0.015	1.81	45,000	675	81,450
Enterprise	0.025	3.18	22,500	562	71,550
Newman 1/	0.021	2.78	45,000	945	125,100
Jumbo 1/	0.021	2.78	22,500	472	62,550
	0.013	1.91	416,219	5,466	796,225
@ 90% recovery at dumps			374,600	4,870	715,486

1/ These dumps were assigned an assay value equal to the average of four other dumps.

The average assays computed above are slightly lower than the estimate of 0.14 oz/ton gold and 2.2 oz/ton silver used in the 1973 report (page 23) which reflects the absence of the Syndicate dump assays in computation. The Syndicate dump provided the highest grade material used in the test heap.

PROPOSED DUMP UTILIZATION

For the 1975 heap construction program, it is proposed to use about 75,000 tons of material from the Group dump. A portable screening plant at the dump will allow the discard of plus 2-inch rock. Material minus 2-inch plus 1/2-inch will be crushed to pass 3/8-inch to go on the pile along with the minus 1/2-inch. The discard is expected to be about 20%

to 25% of the tonnage screened. It is expected that the plus 2-inch discard will be too low grade to warrant processing but this will have to be determined.

Previous sampling of the Group dump showed that 30% to 33.9% was minus 1/2-inch, and these fractions contained precious metal values of $4.85/ton and $4.48/ton, respectively, at $35.00/oz gold and $0.7711/oz silver. At a gold to silver ratio of 1:160, these values can be converted to 0.039 oz Au/ton, 4.53 oz Ag/ton and 0.036 oz Au/ton, 4.176 oz Ag/ton, respectively. At current prices, $165.00 per ounce for gold and $4.30 per ounce for silver, the value of these fractions would be $25.91/ton and $23.90, respectively. As noted, we do not have assays of the different screen fractions so it is not known what portion of the total contained value is represented by the minus 1/2-inch material.

It is reported that some dumps are more uniformly mineralized, thus screening will not produce a markedly higher grade material.

LEACHING OPERATIONS

1974 PROGRAM

The metal recovered in the 1974 operation, covering an operating period of about three months, consisted of 212 ounces gold and 25,986 ounces silver which represents 12.7% of the calculated gold content and 9.6% of the calculated silver content, a metal ratio of 1:122.

According to information from Rico, the calculated metal content of the approximately 77,000 tons in the first heap is 1,667 ounces gold and 268,994 ounces silver, an average grade of 0.216 oz/ton gold and 3.493 oz/ton silver.

Test work during the past winter is reported to have achieved metal recoveries ranging from 63% to 87%. The recovery achieved in the 1973 test heap is reported to be 83% at a metal ratio of about 1:100, indicating slightly better gold recovery.

1975 PROGRAM

In 1975, the original heap will be extended to the north, the addition to consist of perhaps 75,000 tons. This will consist of about 60% to 70% screened product from the Group dump and the remainder from the upper two to four feet of the existing heap. Operating plans now call for a maximum heap thickness of four feet which will probably permit more efficient leaching as well as providing greater safety.

At this time it is impossible to forecast the total metal content of the new pile. Material from the Group dump is relatively low grade as indicated by assays of the Group material on the 1973 test heap. It is expected that the minus 2-inch screen product will contain slightly over 3 ounces silver per ton.

The 1975 leaching operation was started early in May. The extention to the north, heap #2, should be under leach by early summer.

The operation is forecasting gross revenue of about $1.1 million for the year which at the 1974 metal ratio would represent a yield of about 1,600 ounces gold and 195,000 ounces silver. Assuming that about 152,000 tons will be under leach the planned extraction may be calculated as 0.01 oz Au/ton and 1.282 oz Ag/ton. This would represent a very successful season.

An ultra conservative production estimate might forecast gold recovery as low as 700 ounces and silver at 91,000 ounces, or a gross value of about $506,800 which could provide a substantial operating margin if expenses are kept to the $300,000 estimate.

FUTURE OPERATIONS

The next generation of heaps will be placed on the existing heap after it has been leached to an economic end-point. Assuming the base heap will contain 150,000 tons, a second tier might contain about 125,000 to 130,000 tons, at which stage there would still be about 175,000 tons of reserve dump material.

The final generation of heaps will require preparation of a new site, the most likely being the area occupied by the iron calcine storage areas. There is ample space but site preparation may be more costly, particularly if it is decided to save the calcine.

The extraction schedule of the heaps is difficult to forecast. The 1974 campaign was shortened by process changes, and it consisted of only about three months of operation. With an established flowsheet and an operating period of six to seven months on the first heap and four to five months on the second, the 1975 campaign should provide the data needed for an accurate forecast of future operations.

FINANCIAL FORECAST

Basic to the success of the Rico heap leach operation is the present and future price structure of gold and silver. Predicting the price action of these metals is hazardous at best, but the trends during the past year have not been too erratic in spite of strong political and economic influences, both foreign and domestic. From this we would anticipate that the downside risk is minimal for the life of the operation.

Silver has an advantage in that it is essentially an industrial metal subject to a moderately growing demand in the face of static to declining supply of new metal, much of which originates as a by-product or co-product with other metals. Speculative trading has some influence on silver price but less than that on gold.

The Rico operation may be expected to enjoy a somewhat more stable income because of the silver to gold ratio of from 120 to 150 to one by weight.

A tentative forecast of gross sales income by year, and using present sales prices throughout is presented in Table 1. It is intended as a model rather than a production forecast. The time frame is probably longer than necessary; any compression of the operating period will result in lower costs. Size and grade of heaps are rough estimates, as are the metal recoveries used.

Table 1

Production and Gross
Metal Sales Model

Year	Possible Annual Production, oz		Estimated Production, oz										Assumed Annual Metal Sales @ $165.00 Gold and $4.30 Silver	
			Pile No. 1 1/		Pile No. 2 2/		Pile No. 3 3/		Pile No. 4 4/		Pile No. 5 5/			
	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver		
1974	200	26,000	200	26,000									$ 33,000	$ 111,800
1975	700	91,000	500	75,000	200	26,000							115,500	391,300
1976	975	134,900	550	82,500	425	52,400							160,875	580,070
1977	625	93,400		5,000	425	52,400	200	26,000					103,125	401,620
1978	600	85,000					400	56,000	200	29,000			99,000	365,500
1979	750	106,500					400	56,000	350	50,500			123,750	457,950
1980	550	76,500					200	26,000	350	50,500			90,750	328,950
1981	400	76,700									400	57,500	66,000	329,810
1982	330	47,500									330	47,500	54,450	204,250
													$846,450	$3,171,250

Total $4,017,700 = $8.88 per ton leached.

	Heaps	Estimated Grade oz/T Au	Estimated Grade oz/T Ag	Estimated Content Au, oz	Estimated Content Ag, oz	Estimated Recovery Au (75%)	Estimated Recovery Ag (70%)
1/	77,000 tons	0.02	3.5	1667	269,000	1,250	188,300
2/	75,000 tons	0.015	2.5	1125	187,000	844	130,900
3/	125,000 tons	0.013	2.0	1625	250,000	1,220	175,000
4/	100,000 tons	0.013	2.0	1300	200,000	970	140,000
5/	75,000 tons	0.013	2.0	970	150,000	730	105,000

Pile 3 would be placed on piles 1 and 2.
Pile 5 would be placed on pile 4.

Similarly overall costs are difficult to predict. The earlier capital cost estimate for the first heap, including the metal recovery equipment, was probably too low because of the smaller heap actually built, process changes, and environmental mandates. Future heaps will be smaller than originally forecast. Instead of $0.43 per ton for the 400,000 ton reserve originally estimated, a cost of $0.60 per ton for the remaining recoverable 375,000 ton reserve may be expected.

Operating costs were estimated to be about $2.80 per ton for the proposed 100,000 ton pile. On a comparable basis, the cost is now estimated to be about $3.65 per ton reflecting higher haulage and labor costs and other items not originally anticipated. Some reduction of haulage and crushing costs can be realized if from 10% to 25% of some of the dumps can be rejected by screening at the dump sites. Labor, power supplies, and environmental protection costs have increased.

In conclusion, at present prices of $165.00/oz gold and $4.30/oz of silver, the 375,000 tons estimated to be recoverable from the dumps has an average gross value of $10.35 per ton. After a conservative allowance for recovery of metal from the heaps, the estimated average value per ton of leached dump rock is $8.88 per ton. If operating and capital costs can be kept within $5.00 per ton over the life of the operation, the gross margin could reach $1,500,000.